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IS 6932-7 (1973): Method of test for building limes, Part VII: Determination of compressive and transverse strength [CED 4: Building Limes and Gypsum Products]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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REAFFIRMED 2009

IS : 6932 (Part VII) - 1973

(Reaffirmed 1995)

Indian Standard

METHODS OF TESTS FOR BUILDING LIMES

PART VII DETERMINATION OF COMPRESSIVE AND TRANSVERSE STRENGTHS

(Fourth Reprint JULY 1999)

UDC 691.51 : 620.173

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

AMENDMENT NO. 3 JUNE 1985

TO

IS:6932(Parts 1 to 10)-1973 METHODS OF TESTS
FOR BUILDING LIMES

PART 7 DETERMINATION OF COMPRESSIVE AND
TRANSVERSE STRENGTHS

(Page 2, clause 3.1.3.1):

a) *Line 4* - Substitute 'IS:2250-1981' for
'IS:1625-1971'.

b) *Line 5* - Substitute 'sand' for 'cement'

(Page 2, foot-note with '‡' mark) - Substitute
the following for the existing foot-note:

'‡Code of practice for preparation and use of
masonry mortars (*first revision*).'

(BDC 4)

AMENDMENT NO. 4 JULY 2010
TO
IS 6932 (PART 7) : 1973 METHODS OF TESTS FOR
BUILDING LIMES

PART 7 DETERMINATION OF COMPRESSIVE AND
TRANSVERSE STRENGTHS

(Page 1, Foreword, clause **0.2**, line 2) — Substitute ‘IS 712 : 1984’ for ‘IS : 712-1964’.

(Page 1, clause **2.1**, line 2) — Substitute ‘IS 712 : 1984†’ for ‘IS : 712-1973†’.

(Page 1, footnote marked †) — Substitute the following for the existing:

‘†Specification for building limes (*third revision*).’

(Page 2, clause **2.2**, line 1) — Substitute ‘IS 1070 : 1992*’ for ‘IS : 1070-1960*’.

(Page 2, clause **3.1.1**, line 2) — Substitute ‘IS 650 : 1991†’ for ‘IS : 650-1971†’.

(Page 2, clause **3.1.3.2**, line 2) — Substitute ‘IS 460 (Part 1) : 1985§’ for ‘IS : 460-1962§’.

(Page 2, footnote marked *) — Substitute the following for the existing:

‘*Specification for reagent grade water (*third revision*).’

(Page 2, footnote marked §) — Substitute the following for the existing:

‘§Specification for test sieves : Part I Wire cloth test sieves (*third revision*).’

(Page 3, clause **3.1.5**, line 2) — Substitute ‘IS 2250 : 1981*’ for ‘IS : 1625-1971*’.

(Page 3, clause **3.1.6**, line 2) — Substitute ‘IS 650 : 1991†’ for ‘IS : 650-1971†’.

(Page 3, footnote marked *) — Substitute the following for the existing:

‘*Code of practice for preparation and use of masonry mortars (*first revision*).’

(CED 4)

Indian Standard
METHODS OF TESTS FOR BUILDING LIMES
PART VII DETERMINATION OF COMPRESSIVE AND
TRANSVERSE STRENGTHS

0. FOREWORD

0.1 This Indian Standard (Part VII) was adopted by the Indian Standards Institution on 22 March 1973, after the draft finalized by the Building Limes Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Hitherto, methods of tests for assessing qualitative requirements of building limes were included in IS : 712-1964. For facilitating the use of these tests it has been decided to print these tests as different parts of a separate Indian Standard. This part covers determination of compressive and transverse strengths of building limes.

0.3 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard (Part VII) covers the methods of tests for determination of compressive and transverse strengths of building limes.

2. GENERAL

2.1 Preparation of the Sample — The sample shall be prepared in accordance with 7.2 of IS : 712-1973†.

*Rules for rounding off numerical values (*revised*).

†Specification for building limes (*second revision*).

IS : 6932 (Part VII) - 1973

2.2 The distilled water (*see* IS : 1070-1960*) shall be used where use of water as a reagent is intended.

3. GENERAL

3.1 Preparation of Standard Lime-Sand Mortar (1 : 3)

3.1.1 The sand employed for the preparation of mortar shall conform to IS : 650-1971†.

3.1.2 The lime used for the preparation of the mortar shall be either hydrated lime or quicklime.

3.1.3 Adjusted Lime Putty

3.1.3.1 When hydrated lime is used, 500 g of the sample shall be thoroughly mixed with 60 to 65 percent of water for 5 minutes, and the resulting putty shall be passed twice through a mixer of the type given in IS : 1625-1971‡ and used immediately for preparing the standard mortar. Mix 350 g of the putty with an amount of standard cement equal to 3 times the mass of the dry hydrate contained in it, that is, 636 g to 656 g. The balance of the putty shall be discarded. The lime putty and sand shall be thoroughly mixed for 10 minutes continuously, so as to form a uniform plastic mortar.

3.1.3.2 When quicklime is used about 1 kg of the sample shall be crushed to pass through 2·36-mm IS Sieve (conforming to IS : 460-1962§) and slaked isothermally for 1 hour as described in **2.3** of IS : 6932 (Part III)-1973||. The resulting putty shall be stirred with a wooden rod and sieved through 850-micron IS Sieve and collected over a filter cloth as described in **3.2** of IS : 6932 (Part VI)-1973¶. The excess water shall be removed by folding the filter cloth in the form of a gag and pressing moderately by hand. The consistency of the putty shall be adjusted by trial to a water content of 60 to 65 percent by mass of water of the mass of dry hydrated lime. The adjustment shall be carried out by subtracting any excess water from the putty by placing it, after removal from the filter cloth, for a short time on a clean absorbent surface, or alternatively, if oven dry, by adding a small quantity of water and mixing and knocking up thoroughly.

3.1.4 The proportion of water present can be determined by drying a weighed portion rapidly in a drying oven at $100 \pm 10^{\circ}\text{C}$ so that no significant

*Specification for water, distilled quality (*revised*) (Since revised).

†Specification for standard sand for testing of cement (*second revision*).

‡Code of practice for preparation of lime mortar for use in buildings (*first revision*).

§Specification for test sieve (*revised*).

||Methods of tests of building limes: Part III Determination of residue on slaking.

¶Methods of tests of building limes: Part VI Determination of volume yield of quicklime.

amount of carbon dioxide is absorbed in the process, and weighing the dry residue when the loss in mass should be 60 to 65 percent of the mass of the dry residue, or by any convenient alternative method.

3.1.5 The adjusted lime putty shall be thoroughly mixed and knocked up and passed twice through a mixer of the type given in IS : 1625-1971* and used immediately for preparing the mortar.

3.1.6 Thoroughly mix 350 g of the putty with an amount of standard sand conforming to IS : 650-1971† equal to 3 times the mass of the dry hydrate contained in it, that is, 636 to 656 g. The balance of the putty shall be discarded. The lime putty and sand shall be thoroughly mixed and knocked up for 10 minutes continuously, so as to form a uniform plastic mortar. The mortar so prepared shall be used immediately for filling the moulds for strength tests.

The whole operation starting from the slaking of the quicklime up to the filling of the moulds shall be carried out as expeditiously as possible.

3.2 Transverse Strength

3.2.1 Preparation of Test Specimen

3.2.1.1 Six test specimens each 2.5 cm square in cross-section and 10.0 cm in length shall be prepared using the standard lime and mortar specified under 3.1. The mould used shall be an individual or gang-mould of bronze or other suitable non-corrodible metal, and of internal dimensions 2.5 cm square and 10.0 cm long, the inner surface of the mould shall be carefully machined to a tolerance of ± 0.002 cm and the mould shall be so constructed that the specimens can be removed without the mould being tapped. The mould shall be well greased with petroleum jelly before use, and shall rest on a well-greased non-corrodible plate during the filling operations. The mould shall be filled by hand, the mortar being pressed in with the thumb, lightly tamped, and then smoothed off with two or three strokes of palette knife.

3.2.1.2 The filled mould together with its base plate and covered on the top with a similar plate shall be stored for a period of 28 days undisturbed in a suitable container in an atmosphere of at least 90 percent RH and at a temperature of $27 \pm 2^\circ\text{C}$. A record shall be made of the temperature of storage on at least 24 days of the 28 days period. The maximum and minimum temperatures shall be read from time to time, in order to check any possible wide variations of temperature that may have occurred whilst the apparatus was not under direct observation.

3.2.2 Procedure — After the expiry of the period of storage specified under 3.2.1.2 the specimens shall be removed from the mould, care being

*Code of practice for preparation of lime mortar for use in buildings (*first revision*).

†Specification for standard sand for testing of cement (*second revision*).

taken not to injure them in any way during this process, and immersed in water for a period of half an hour. They shall be then removed and tested immediately for transverse strength. The specimens to be tested shall rest symmetrically on their sides on two parallel metal rollers 4 cm in diameter and spaced at 8.0 cm centres. The load shall be applied through a third parallel roller of the same size at a point midway between the other two. No packing shall be used between the rollers and the specimen. The load shall be applied steadily and uniformly, starting from zero, and increased at a rate of 15 kg/min \pm 10 percent.

3.2.3 Evaluation and Report of Test Results

3.2.3.1 The modulus of rupture of the specimen is obtained by the formula:

$$t = kP$$

where t is the modulus of rupture, P is the total load and k is a factor. The value of k is equal to 0.768 when the modulus of rupture is expressed in kg/cm², P in kg and the dimensions of the specimen in cm.

3.2.3.2 The average of the 6 test specimens shall be taken as the modulus of rupture of the mortar and the result shall be expressed in kg/cm².

3.3 Compressive Strength

3.3.1 Preparation of Test Specimens — Twelve cubes with side 5.0 cm shall be prepared from standard lime-sand mortar specified under 3.1 using bronze or other non-corrodible metallic moulds which shall be so designed as to prevent spreading during moulding. The inner surface of the moulds shall be carefully machined to a tolerance of \pm 0.002 cm and the moulds shall be so constructed that the specimens can be removed without tapping them. The moulds shall be filled by hand, the mortar being pressed in with the thumb, lightly tamped, smoothed off with two or three strokes of the trowel or palette knife stored undisturbed in a suitable container for a period of 72 hours in an atmosphere of at least 90 percent RH and at a temperature of $27 \pm 2^\circ\text{C}$. After the expiry of this period the specimens shall be taken out of the moulds and placed in the air in the laboratory for 4 days. When 7 days old, the specimens shall be immersed in clean water and left there until just prior to testing for its strength in the testing machine. The water shall be renewed every 3 days and maintained at a temperature of $27 \pm 2^\circ\text{C}$.

3.3.2 Procedure — After 7 days of storage in water (and in the case of Class B limes, under moist sand) 6 of the cubes shall be taken out of water, wiped surface-dry and tested for compressive strength in a compression testing machine. This gives the strength at 14 days. Those faces of the cube specimens which when moulded were in contact with the sides of the mould shall be placed in contact with the surface through which load is applied. There shall be no packing between the cube and steel platens of the testing

machine. One of the platens shall be carried on the ball and shall be self adjusting. The load shall be steadily and uniformly applied, starting from zero increasing at the rate of 15 kg/min.

3.3.2.1 The remaining 6 test specimens shall be taken out after 21 days and similarly tested thus determining the compressive strength at 28 days.

3.3.3 *Evaluation and Report of Test Results* — The crushing load divided by the area over which the load is applied denotes the compressive strength of the mortar.

3.3.3.1 The average strength of the six specimens shall be taken as the compressive strength of the mortar and the result expressed in kg/cm².

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